IS 13871 (1993): Powder Coatings [CHD 20: Paints, Varnishes and Related Products]

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IS 13871 : 1993
[Reaffirmed 2002]

भारतीय मानक

पाऊडर लेपन – विशिष्टि

Indian Standard

POWDER COATINGS — SPECIFICATION

UDC 621·793·8 [678·664] : 669·141·24

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

October 1993

Price Group 3

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Industrial Paints Sectional Committee had been approved by the Chemical Division Council.

The material is normally intended for protection and decoration of mild steel parts/components in various industries such as Domestic Appliances, Automobile and Two Wheeler Components. It covers the various grades, for example, Epoxy, Epoxy Polyester, Polyester/TGIC and Polyurethane powders. Epoxy and Epoxy Polyester grade powders are normally meant for interior use while Polyester/TGIC based powders are suitable for exterior exposure conditions. Surface treatment by shot blasting or phosphating shall be provided for proper results with the use of powder coatings.

A scheme for labelling environment friendly products to be known as ECO Mark is being introduced at the instance of the Ministry of Environment and Forests (MEF). The ECO Mark shall be administered by the Bureau of Indian Standards (BIS) under the BIS Act, 1986 as per the Resolution No. 71 dated 20 February 1991 published in the Gazette of the Government of India. For a product to be eligible for ECO Mark it shall also carry Standard Mark of BIS for quality besides meeting additional environment friendly (EF) requirements. The criteria for ECO Mark for powder coating have been included in this standard as optional requirements.

The committee responsible for the preparation of this standard is given in Annex D.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

POWDER COATINGS — SPECIFICATION

1 SCOPE

This standard prescribes requirements and methods of sampling and test for thermosetting powder Coatings.

2 REFERENCES

The Indian Standards listed in Annex A are necessary adjuncts to this standard.

3 TERMINOLOGY

3.1 For the purpose of this standard, the definitions given in IS 1303 : 1983 and the following shall apply.

3.1.1 *Volatile Organic Compounds (VOC)*

It is defined as the volatile matter content minus the water content.

4 GRADES

The material shall be of three grades depending upon its finish as given below:

Grade A — Glossy finish,

Grade B — Semi-glossy finish, and

Grade C — Matt finish.

5 REQUIREMENTS

5.1 Description

The material shall be free flowing powder based on synthetic resins, hardeners, pigments, fillers and additives suitable for application by standard methods, for example, electrostatic spraying, tribostatic spraying, fluidized bed coating, etc. It shall give a continuous, smooth and hard film when applied by one of the above methods and stoved as per schedule prescribed by the supplier. The powder application parameters will be as agreed between the supplier and the user.

5.2 Particle Size Distribution

It shall depend on the method of application, type of equipment, etc, as agreed between the supplier and the user.

5.3 Relative Density

It shall be within ±3 percent of the approved sample.

5.4 The reactivity of the powder shall be as per the approved sample.

5.5 The curing schedule should be followed as agreed to between the purchaser and the supplier. The cured film shall also conform to the requirements given in Table 1.

Table 1 Requirements of Powder Coatings

(*Clauses* 5.5 *and* 8.1)

Sl No.	Characteristics	Requirements			Method of Test, Ref to IS 101
		Grade A	Grade B	Grade C	
(1)	(2)	(3)			(4)
i)	Dry film thickness	50-60 microns unless specified otherwise			Part 3/Sec 2 : 1989
ii)	Finish	Smooth	Smooth	Smooth	Part 3/Sec 4 : 1987
iii)	Gloss 60°	Above 80	10—80	Below 10	Part 4/Sec 4 : 1988
iv)	Scratch hardness 3 000 g	No such scratches as to show bare metal			Part 5/Sec 1 : 1988
v)	Flexibility 6·25 mm mandrel	No visible damage or detachment of film			Part 5/Sec 2 : 1988
vi)	Cross cut adhesion	No visible damage or detachment of film			do
vii)	Erichsen test, mm	8·0 pass	*3·0-7·0 pass	3·0 pass	4 of Part 5/Sec 2 : 1988
viii)	Impact resistance (direct/reverse), kg/cm	250 pass	150 pass	150 pass	Part 5/Sec 3 : 1988
ix)	Protection against corrosion, 1 000 h	No blistering, rusting or loss of adhesion			Part 6/Sec 1 : 1988

Table 1 (*concluded*)

Sl No.	Characteristics	Requirements			Method of Test, Ref to IS 101
		Grade A	Grade B	Grade C	
(1)	(2)	(3)			(4)
x)	Protection against humidity	No blistering, rusting or loss of adhesion			Part 6/Sec 1 : 1988
xi)	Resistance to boiling water 1/2 h at 100°C	No blisters, No visible damage, change in gloss and adhesion			Part 7/Sec 1 : 1989
xii)	Resistance to lubricating oil, SAE 30	To pass the test			Part 7/Sec 2 : 1990
xiii)	Resistance to petrol	To pass the test			do
xiv)	Resistance to heat double bake schedule	No appreciable change of colour or deteriorate in the mechanical properties			Part 7/Sec 3 : 1990
xv)	Resistance to bleeding	To pass the test			Part 7/Sec 4 : 1990
xvi)	Resistance to detergents	do			Annex B
xvii)	Resistance to acid/alkali	do			Annex C

* Exact value to be agreed to between the purchaser and the supplier.

5.6 Optional Requirements for ECO Mark

5.6.1 *General Requirements*

5.6.1.1 The product shall conform to the requirements for quality and performance prescribed under **5.1** to **5.5**.

5.6.1.2 The manufacturers shall produce to BIS environmental consent from the concerned State Pollution Control Board as per the norms laid down under the Water (Prevention and Control of Pollution) Act 1974, and Air (Prevention and Control of Pollution) Act 1981 along with the authorization, if required under the Environment (Protection) Act 1986, while applying for ECO Mark.

5.6.2 *Specific Requirements*

5.6.2.1 The material shall not contain any Volatile Organic Compounds, when tested according to the method prescribed in IS 101 (Part 2/Sec 1) : 1988 and IS 101 (Part 2/Sec 2) : 1986.

5.6.2.2 The material shall not contain more than 0·1 percent as metal of any toxic metals such as lead, cadmium, chromium (VI) when tested by the relevant Atomic Absorption Spectroscopic methods.

5.6.2.3 The material shall be free from carcinogenic ingredients.

6 PACKING AND MARKING

6.1 Packing

The material shall be packed in suitable containers as agreed to between the purchaser and the supplier.

6.1.1 The product for ECO mark shall be packed in such packages which shall be recyclable/reusable or biodegradable. It shall be accompanied by instructions for proper use so as to maximize product performance and minimize wastage.

6.1.2 *Storage*

The powder should be stored in a cool and dry place at a temperature not exceeding 25°C and at a relative humidity not more than 65 percent. Direct exposure of the powder to heat or sunlight must be avoided. The storage life of powders under above conditions will not be less than 6 months.

6.2 Marking

6.2.1 The material shall be marked with the following:

a) Indication of the source of manufacture;
b) Grade and mass of the material;
c) Lot number or Batch number and validity period;
d) Month and year of manufacture; and
e) Recommended stoving schedule.

6.2.2 The product for ECO mark shall also be marked with the following additional information on the containers:

a) List of identified critical ingredients in descending order of quantity, percent by mass; and
b) The criteria for which the product has been labelled as ECO mark.

7 SAMPLING

7.1 Representative samples of the material shall be drawn as prescribed in IS 101 (Part 1/Sec 1) : 1986.

7.2 Criteria of Conformity

A lot shall be described as conforming to the requirements of this standard, if the test results of the composite sample satisfy all the requirements prescribed under **5**.

8 TESTS

8.1 Test shall be conducted as referred in col 4 of Table 1.

8.2 Quality of Reagents

Unless otherwise specified, pure chemicals and distilled water (*see* IS 1070 : 1992) shall be employed.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

ANNEX A

(*Item* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
101 (Part 1/ Sec 1) : 1986	Methods of sampling and test for paints, varnishes and related products : Part 1 Test on liquid paints (general and physical), Section 1 Sampling (*third revision*)
101 (Part 1/ Sec 3) : 1986	Methods of sampling and test for paints, varnishes and related products : Part 1 Test on liquid paints (general and physical), Section 3 Preparation of panels (*third revision*)
101 (Part 2/ Sec 1) : 1988	Methods of sampling and test for paints, varnishes and related products : Part 2 Test on liquid paints (chemical examination), Section 1 Water content (*third revision*)
101 (Part 2/ Sec 2) : 1986	Methods of sampling and test for paints, varnishes and related products : Part 2 Test on liquid paints (chemical examination), Section 2 Volatile matter (*third revision*)
101 (Part 3/ Sec 2) : 1989	Methods of sampling and test for paints, varnishes and related products : Part 3 Tests on paint film formation, Section 2 Film thickness (*third revision*)
101 (Part 3/ Sec 4) : 1987	Methods of sampling and test for paints, varnishes and related products : Part 3 Tests on paint film formation, Section 4 Finish (*third revision*)
101 (Part 4/ Sec 4) : 1988	Methods of sampling and test for paints, varnishes and related products : Part 4 Optical tests on paints, Section 4 Gloss (*third revision*)
101 (Part 5/ Sec 1) : 1988	Methods of sampling and test for paints, varnishes and related products : Part 5 Mechanical tests on paint films, Section 1 Hardness test (*third revision*)
101 (Part 5/ Sec 2) : 1988	Methods of sampling and test for paints, varnishes and related products : Part 5 Mechanical tests on paint films, Section 2 Flexibility and adhesion tests (*third revision*)
101 (Part 5/ Sec 3) : 1988	Methods of sampling and test for paints, varnishes and related products : Part 5 Mechanical tests on paint films, Section 3 Impact test (falling ball test) (*third revision*)
101 (Part 6/ Sec 1) : 1988	Methods of sampling and test for paints, varnishes and related products: Part 6 Durability tests, Section 1 Resistance to humidity under conditions of condensation (*third revision*)
101 (Part 7/ Sec 1) : 1989	Methods of sampling and test for paints, varnishes and related products : Part 7 Environmental tests on paint films, Section 1 Resistance to water (*third revision*)
101 (Part 7/ Sec 2) : 1990	Methods of sampling and test for paints, varnishes and related products: Part 7 Environmental tests on paint films, Section 2 Resistance to liquids (*third revision*)
101 (Part 7/ Sec 3) : 1990	Methods of sampling and test for paints, varnishes and related products : Part 7 Environmental tests on paint films, Section 3 Resistance to heat (*third revision*)
101 (Part 7/ Sec 4) : 1990	Methods of sampling and test for paints, varnishes and related products : Part 7 Environmental tests on paint films, Section 4 Resistance to bleeding of pigments (*third revision*)
1070 : 1992	Reagent grade water (*third revision*)
1303 : 1983	Glossary of terms relating to paints and related products (*first revision*)

ANNEX B

[*Table* 1, *Sl No.* (xvi)]

RESISTANCE TO DETERGENTS TEST

B-0 PRINCIPLE

This method covers the determination of the resistance to failure, in an accelerated manner, of powder coatings when immersed in a detergent solution.

B-1 APPARATUS

B-1.1 Container

A corrosion resistant container equipped with the means to control the solution temperature within 74 ± 1°C and to control the liquid level at 5 mm.

B-1.2 Cover

The container shall be provided with a cover to retard evaporation and to contain the test specimens completely.

B-2 TEST SPECIMENS

B-2.1 Unless otherwise specified, the test specimens shall be 100 mm × 300 mm × 0·9 mm in size and it shall be prepared as prescribed in IS 101 (Part 1/ Sec 3) : 1987.

B-2.2 The method of application, film thickness, curing and conditioning of the test surface shall be agreed upon by the purchaser and the supplier.

B-2.3 The backs, cut edges and those areas containing identification marks or in contact with the supports, shall be protected with a suitable coating that is stable under the conditions of test.

B-3 DETERGENT SOLUTION

The composition and concentration of the detergent solution shall be agreed upon by the purchaser and the supplier. The temperature normally shall be 74 ± 1°C.

B-4 PROCEDURE

B-4.1 Immersion

Suspend the test specimens vertically in the container so that at least one half of the surface area is submerged in the detergent solution. Separate the test specimens so that they are not in contact with any metal and are no closer together than 25 mm at any point in the bath. Replace the detergent solution with fresh detergent solution every 168 h. If successive tests are to be correlated, use reference panels coated with a control paint.

B-4.2 Examination of Specimens

When the specimens are ready for examination, carefully remove, gently wash or dip in clean running water not warmer than the temperature of the detergent solution to remove the detergent from the surface, and then carefully dry by blowing with air or blotting with absorbent paper. During the progress of the test, examine for deterioration of the film immediately. If reimmersion is necessary, do not allow the specimen to remain out of the liquid in excess of 1/2 h, unless otherwise specified. Examine the test coating for blisters, rust and loss of adhesion. The sample will be treated as passing if no more than minute rusting, no loss of adhesion and not more than 8 blisters are observed.

ANNEX C

[*Table* 1, *Sl No.* (xvii)]

RESISTANCE TO ACID/ALKALI TEST

C-0 PRINCIPLE

This method covers the determination of the resistance to failure, in an accelerated manner, of powder coatings when immersed in acid and alkali solutions for a fixed period.

C-1 APPARATUS

C-1.1 Containers

Corrosion resistant containers equipped with the means to control the solution temperature within 60 ± 1°C and to control the liquid level at 5 mm.

C-1.2 Cover

The containers shall be provided with covers to retard evaporation and to contain the test specimens completely.

C-2 TEST SPECIMENS

C-2.1 The test specimens shall be prepared as in **B-2.1** above.

C-3 REAGENTS

C-3.1 Hydrochloric Acid, 10 percent.

C-3.2 Nitric Acid, 10 percent.

C-3.3 Sulphuric Acid, 20 percent.

C-3.4 Sodium Hydroxide, 25 percent.

C-4 PROCEDURE

C-4.1 Immersion

Suspend the test specimens vertically in the container so that at least one half of the surface area is submerged in the solutions in the order nitric acid, sulphuric acid, hydrochloric acid and sodium hydroxide for a period of 12 h each. Separate the test specimens so that they are not in contact with any metal and are no closer together than 25 mm at any point in the bath. Replace the test solutions with fresh solutions every 168 h. If successive tests are to be correlated, use reference panels coated with a control paint.

C-4.2 Examination of Specimens

When the specimens are ready for transfer and/or examination, carefully remove, gently wash or dip in clean running water not warmer than the temperature of the test solution to remove the excess solution from the surface, and then carefully dry by blowing with air or blotting with absorbent paper. Examine the test coating for blisters, flaking and corrosion. The sample shall be treated as passing if there is no blistering, flaking and corrosion.

ANNEX D

(Foreword)

COMMITTEE COMPOSITION

Industrial Paints Sectional Committee, CHD 031

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Member Secretary
SHRI R. NARUALA
Joint Director (Chem), BIS

Standard Mark

The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act. 1986* and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 1986* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Handbook' and 'Standards Monthly Additions'. Comments on this Indian Standard may be sent to BIS giving the following reference:

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Amendments Issued Since Publication

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TO
IS 13871 : 1993 POWDER COATINGS — SPECIFICATION

(*Page* 5, *clause* **C-4.1**, *line* 3) — Substitute the word 'namely' *for* 'in the order'.

(CHD 20)

Reprography Unit, BIS, New Delhi, India